PATENT APPLICATION OF

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FOR

SEALED CONTAINER WITH ENCLOSED OPENING MEANS

BACKGROUND-FIELD OF INVENTION

The present invention relates generally to a sealed container with an opening means enclosed within the container for releasing the liquids enclosed within the container.

BACKGROUND-DESCRIPTION OF RELATED ART

A variety of opening means exists for opening a container. Most opening means are in the form of a screw-on cap or a snap-on cap. Some opening means are in the form of a frangible seal or a score line on the container that will allow the contents of the container to be released upon fracturing of the frangible seal or the container at the score line. All of these opening means are either attached to the container externally, such as the screw-on cap and the snap-on cap, or are formed as part of the container, such as the frangible seal and the score line on the

container. None of the opening means are designed to be enclosed within the container to seal a liquid in the container and yet still allow the release of the liquids easily and reliably. The availability of an effective and easy to use opening means is particularly lacking for a small elongated container with a small cross-sectional area.

SUMMARY OF THE INVENTION

The present invention is an elongated sealed container with a self-contained opening means fully enclosed within the container to release the liquid sealed within the container. The enclosed opening means may be operated by either squeezing or bending the elongated sealed container at or near the enclosed opening means. Once the enclosed opening means is opened, the liquid sealed within the elongated sealed container may be released for application. When the elongated sealed container has a small cross-section such that the liquid within it cannot be released due to its surface tension, a guiding member may be utilized to increase the capillary action and to overcome the surface tension of the liquid to release the liquid from the elongated sealed container. There are no loose parts that may be lost and all components are completely sealed within the container.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the preferred embodiment of the sealed container with enclosed opening means.

Figure 2 shows another embodiment of the sealed container with enclosed opening means.

Figure 3 shows another embodiment of the sealed container with enclosed opening means.

Figure 4 shows another embodiment of the sealed container with enclosed opening means.

Figure 5 shows another embodiment of the sealed container with enclosed opening means.

Figure 6 shows one embodiment of the opening means in the closed condition.

Figure 7 shows the opening means of figure 6 in the open position to release the liquids in the sealed container to be released.

Figure 8 shows one embodiment of the opening means in the closed condition.

Figure 9 shows the opening means of figure 8 in the open position to release the liquids in the sealed container to be released.

Figure 10 shows one embodiment of the opening means in the closed condition.

Figure 11 shows the opening means of figure 10 in the open position to release the liquids in the sealed container to be released.

Figure 12 shows one embodiment of the opening means in the closed condition.

Figure 13 shows the opening means of figure 12 in the open position to release the liquids in the sealed container to be released.

Figure 14 shows one embodiment of the opening means in the closed condition.

Figure 15 shows the opening means of figure 14 in the open position to release the liquids in the sealed container to be released.

Figure 16 shows one embodiment of the opening means in the closed condition.

Figure 17 shows the opening means of figure 16 in the open position to release the liquids in the sealed container to be released.

Figure 18 shows one embodiment of the opening means in the closed condition.

Figure 19 shows the opening means of figure 18 in the open position to release the liquids in the sealed container to be released.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows the preferred embodiment of the sealed container with enclosed opening means. In the preferred embodiment, the sealed container with enclosed opening means comprises of an elongated tubular housing **1** with a sealed end **2** and an open end **3**. A liquid **4** is enclosed within the elongated tubular housing **1** near the sealed end **2**. An enclosed opening means **5** is disposed inside the elongated tubular housing **1** sealing the liquid **4** within the elongated tubular housing **1**. The opening means **5** may be operated either by squeezing or bending the elongated tubular housing **1** at or neat the enclosed opening means **5**.

When the elongated tubular housing **1** has a small cross-section such that the liquid **4** within it cannot be released simply by opening the opening means **5** due to its surface tension, a guiding member **6, 7** may be utilized to increase the capillary action and to overcome the surface tension of the liquid **4** to release the liquid **4** from the elongated tubular housing **1** as shown in figures 2, 4, and 5.

One embodiment of the enclosed opening means **5** is shown in figure 3 wherein the enclosed opening means **5** comprises of a cylinder **8** with an outside diameter approximately that of the inside diameter of the elongated tubular housing **1** defining a small liquid path from the open end **3** of the elongated tubular housing **1** to the liquid **4**. The end near the liquid **4** has an elongated protrusion **9** that is smaller in diameter than the cylindrical body of the enclosed opening means **5** and is separable from the cylindrical body of the enclosed opening means **5**. The elongated protrusion **9** seals the small liquid path in the cylinder **8** and prevents the liquid **4** in the elongated tubular housing **1** from being released through the enclosed opening means **5**. When the elongated tubular housing **1** is bent near the junction between the elongated protrusion

9 and the cylindrical body of the enclosed opening means **5**, the elongated protrusion **9** will be separated from the cylindrical body and the small liquid path is exposed for the liquid **4** to be released from the elongated tubular housing **1** through the opening means **5**.

Figure 4 shows another embodiment of the sealed container with enclosed opening means. In this embodiment, the sealed container with enclosed opening means comprises of an elongated bendable tubular housing **1** with a small cross-section and with a sealed end **2** and an open end **3**. A liquid **4** is enclosed within the elongated tubular housing **1** near the sealed end **2**. An enclosed opening means **5** is disposed inside the elongated tubular housing **1** sealing the liquid **4** within the elongated tubular housing **1**.

The enclosed opening means **5** comprises of a hollow cylindrical body **10** with an open end **11** toward the liquid **4** and a sealed end with an elongated member **12** extending away from the hollow cylindrical body **10** towards the open end **3** of the elongated bendable tubular housing **1** and terminating near the open end **3** of the elongated bendable tubular housing **1**. A frangible section **13**, which may be formed by a score line on the outer surface of the hollow cylindrical body **10**, is formed on the hollow cylindrical body **10** near the sealed end of the hollow cylindrical body **10**.

When the tubular housing **1** is bent at or near the frangible section **13** of the hollow cylindrical body **10** of the opening means **5**, the sealed end of the hollow cylindrical body **10** will separate from the open end **11** of the hollow cylindrical body **10** which results in a through liquid path from the liquid **4** to the open end **3** of the elongated tubular housing **1**. Due to the small cross-section of the elongated bendable tubular housing **1**, the liquid **4** will not flow freely out of the tubular housing **1** due to surface tension of the liquid **4**. The liquid **4** may be selectively released from the tubular housing **1** by squeezing the portion of the tubular housing **1** containing

the liquid **4** to force the liquid **4** toward the elongated member **12**. Once the liquid **4** reaches the elongated member **12**, the elongated member **12** will increase the capillary action of the liquid **4** to overcome the surface tension of the liquid **4** within the tubular housing **1** to allow it to freely flow out of the tubular housing **1**.

If immediate release of the liquid **4** upon opening of the opening means **5** is desired, a second elongated member **14** may be affixed to the sealed end **2** of the tubular housing **1** and extending to near the open end **11** of the cylindrical body **10** as shown in figure 5 to increase the capillary action of the liquid **4** to overcome the surface tension of the liquid **4** to allow the liquid **4** to be immediately released from the tubular housing **1** upon opening of the opening means **5** without being squeezed.

Figure 6 shows another embodiment of the enclosed opening means **5**. In this embodiment, the enclosed opening means **5** comprises of a deformable cup **15** with a diameter approximately that of the inside diameter of the tubular housing **1** and a length that is longer than the diameter. The deformable cup **15** is inserted into the tubular housing **1** to seal the liquid **4** within the tubular housing **1**. As shown in figure 7, upon bending or squeezing the tubular housing **1** at or near the opening means **5**, the deformable cup **15** is deformed and a liquid flow path is exposed to allow the liquid **4** to be released from the tubular housing **1**. A deformable sphere such as a plastic hollow ball with approximately that of the inside diameter of the tubular housing **1** may also be used instead of the deformable cup **15**. Upon bending or squeezing the tubular housing **1** at the opening means **5**, the deformable sphere will be deformed and a liquid flow path is exposed to allow the liquid **4** to be release from the tubular housing **1**.

Figure 8 shows another embodiment of the enclosed opening means **5**. In this embodiment, the enclosed opening means **5** comprises of a plug **16** that is fracturable into two

parts at a fracture surface **17** when it is bent. The plug **16** has one or more holes **18** extending from each end of the plug **16** pass the fracture surface **17** without passing through the other end of the plug **16**. As shown in figure 9, upon bending of the tubular housing **1** at or near the plug **16**, the plug **16** will separate into two sections at the fracture surface **17** and one or more liquid flow paths are formed leading from the liquid **4** to the open end **3** of the tubular housing **1**. The plug **16** may also be fracturable or separable when it is twisted such that if the tubular housing can be twisted at the opening means **5** to open the liquid flow path. The tubular housing may be formed by two sections that are screwed together at the plug **16** such that twisting the tubular housing will separate the plug **16** into two parts.

Figure 10 shows another embodiment of the enclosed opening means **5** wherein the enclosed opening means **5** comprises of a cylindrical section **19** with a reduced outside diameter waist section **20** and two ends **21** with outside diameters approximately that of the inside diameter of the tubular housing **1**. The cylindrical section **19** has a through hole **22** in its axial direction forming a liquid flow path from the liquid **4** to the open end **3** of the tubular housing **1**. An elongated member **23** is affixed to the sealed end **2** and extending into the hole **22** in the cylindrical section **19**, thereby sealing the hole **22** and the liquid flow path. When the tubular housing **1** is bent at or near the cylindrical section **19**, the elongated member **23** will be pulled out of the hole **22** in the cylindrical section **19** and the liquid flow path from the liquid **4** to the open end **3** of the tubular housing **1** is exposed as shown in figure 11. The liquid **4** may then be released from the tubular housing **1**.

Figure 12 shows another embodiment of the enclosed opening means **5** wherein the enclosed opening means **5** comprises of two circular discs **24, 25** with approximately the same cross-section as the inside diameter of the tubular housing **1** and with sufficient thickness to

prevent them from flipping inside the tubular housing **1**. Each circular disc **24, 25** has one or more holes **26, 27** through it positioned such that when the two circular discs **24, 25** are placed next to each other in the tubular housing **1**, the holes **26, 27** in each circular disc will be covered by the other disc therefore all the holes **26, 27** in both circular discs **24, 25** are sealed by the other circular disc. When the tubular housing **1** is bent at or near the two circular discs **24, 25**, the deformation of the tubular housing **1** will cause the two circular discs **24, 25** to separate from each other and a liquid flow path will result from the liquid **4** to the open end **3** of the tubular housing **1** as shown in figure 13. The separation between the two circular discs **24, 25** may also be formed by twisting the tubular housing if the tubular housing can be twisted at the opening means **5** to open the liquid flow path. The tubular housing may be formed by two sections that are screwed together at the interface between the two circular discs **24, 25** such that twisting the tubular housing will separate the two circular discs **24, 25**.

Figure 14 shows another embodiment of the enclosed opening means **5** wherein the enclosed opening means **5** comprises of a cylindrical section **28** with sufficient length to prevent it from turning inside the tubular housing **1**. The cylindrical section **28** has a diagonal slit **29** formed diagonally from one end to the other with a thin section of material **30** connecting the two halves of the cylindrical section **28** and sealing the liquid **4** in the tubular housing **1** behind the cylindrical section **28**. When the cylindrical section **28** is compressed by squeezing the tubular housing **1**, the two halves of the cylindrical section **28** will slide against each other and press together thereby reducing the cross-section of the cylindrical section **28**. A liquid flow path is therefore formed between the outside of the cylindrical section **28** and the inside wall of the tubular housing **1** to allow the liquid **4** to be released from the tubular housing **1**.

Figure 16 shows another embodiment of the enclosed opening means **5** wherein the opening means **5** comprises of a section of material **31** with approximately the same diameter near its mid-section **32** as the inside diameter of the tubular housing **1**. The first end **33** of the section of material **31** is formed in the form of two prongs that will act as handles wherein opposing forces can be applied by squeezing the two prongs toward each other. The second end **34** of the section of material **31** has a smaller cross-section than the inside diameter of the tubular housing **1** and a fracture surface **35** is formed from the second end **34** to near where the two prongs at the first end **33** are joined. When the two prongs are squeezed toward each other by squeezing the tubular housing **1**, the section of material **31** will fracture into two halves along the fracture surface **35** along its longitudinal direction and open a liquid flow path through the section of material **31** to allow the release of the liquid **4** from the tubular housing **1** as shown in figure 17.

Figure 18 shows another embodiment of the enclosed opening means **5** wherein the enclosed opening means **5** comprises of an elongated cup **36** with a diameter approximately that of the inside diameter of the tubular housing **1** and a length that is longer than the diameter. The closed end **37** of the elongated cup **36** is formed in an elongated protrusion with a fracture line **38** formed around the elongated protrusion positioned along the elongated cup **36** at a point where when the elongated protrusion is fractured, an opening will be formed at the closed end **37** of the elongated cup **36**. The elongated cup **36** is inserted into the tubular housing **1** to seal the liquid **4** within the tubular housing **1**. As shown in figure 19, upon bending the tubular housing **1** near the closed end **37** of the elongated cup **36**, the elongated protrusion will fracture from the elongated cup **36** at the fracture line **38** and a liquid flow path is exposed to allow the liquid **4** to be released from the tubular housing **1**.

Although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Thus the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.